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The Oncomiracidium of *Heteraxine heterocerca*, a Monogenean Gill Parasite of the Yellowtail *Seriola quinqueradiata*

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With 1 Text-figure

Abstract The oncomiracidium of the polyopisthocotylean monogenean *Heteraxine heterocerca*, from the gills of the yellowtail, *Seriola quinqueradiata*, is re-described.

Introduction

The yellowtail, *Seriola quinqueradiata*, is an important food fish cultured extensively in marine fish farms in southern Japan and, in these farms, the gills are commonly infected with the polyopisthocotylean monogenean *Heteraxine heterocerca* (Goto, 1894) Yamaguti, 1938. In spite of the commercial importance of this parasite, its oncomiracidium is poorly known. The oncomiracidium was hatched by Harada & Akazaki (1971) but was not described and a later account by Ogawa & Egusa (1981) is incomplete. During visits by the two senior authors to the National Research Institute of Aquaculture at Nansei, Mie Prefecture, Japan and the Seto Marine Biological Laboratory at Shirahama, Wakayama Prefecture in October 1990, the opportunity arose to study living oncomiracidia of this parasite.

Materials and Methods

Eggs were collected in the following way from parasites *in situ* on the gills of yellowtail maintained at the National Research Institute of Aquaculture. Pieces of nylon netting with a mesh size of about 1.5 mm were suspended in the tanks containing the infected fishes. Eggs laid by the parasites do not adhere to the fish but enter the water, where they are kept in suspension by the swimming activity of thier hosts until they become entangled by their egg appendages in the nylon netting. The netting with

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attached eggs was transported to Shirahama and incubated in sea water at about 23°C. The sea water was changed twice daily. Living oncomiracidia were restrained with slight coverslip compression and observed using phase contrast and interference contrast equipment. Photomicrography was used to record the shapes of the hooks.

Results and Discussion

The eggs of *H. heterocerca* began to hatch after incubation for about 5 days at 23° C and, when exposed to the natural cycle of illumination, emerged mainly at dusk and during the first few hours of darkness (Kearn, Ogawa & Maeno, 1992). The anatomy of the oncomiracidium is illustrated in Fig. 1. Dimensions of the oncomi-

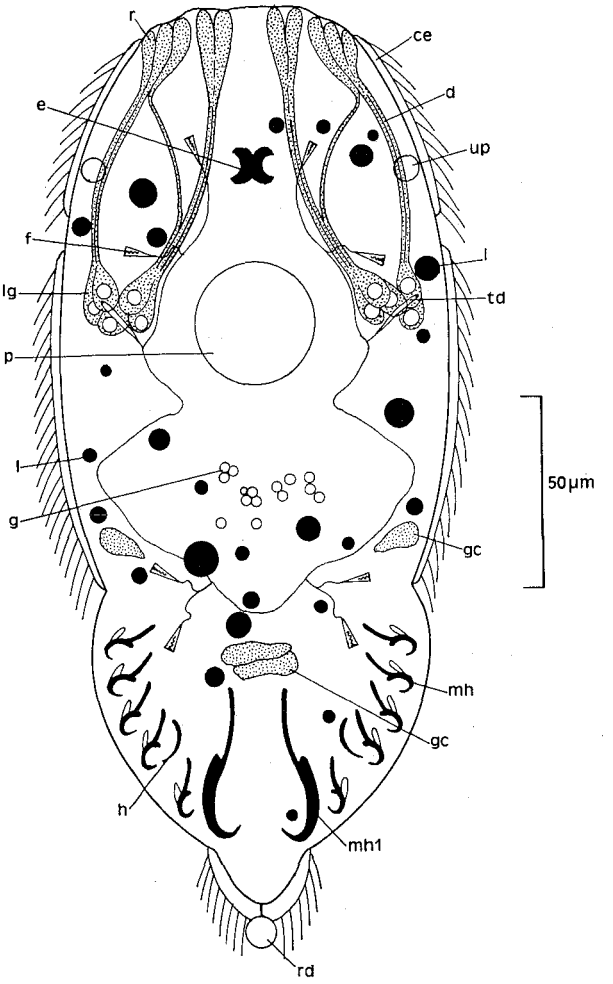

Fig. 1. The oncomiracidium of *Heteraxine heterocerca*. ce, Ciliated epidermis; d, duct of lateral head gland; e, eye; f, flame cell; g, granules possibly within intestine; gc, gland (?) cell; h, hamulus primordium; l, lipid (?) droplet; lg, lateral head gland; mh, marginal hooklet; mh I, marginal hooklet I; p, pharynx; r, reservoir of lateral head gland; rd, refringent terminal droplet; td, terminal duct of excretory system; up, unpigmented photoreceptor (?).

racidia have been given by Ogawa & Egusa (1981). Lightly flattened living parasites are approximately 230 μm in length and 110 μm in breadth. The main features of the oncomiracidium, reported by Ogawa & Egusa are as follows: a pair of eyes without lenses situated back to back in the mid-line anterior to the pharynx; two transverse zones of ciliated cells on the body and a ciliated cone on the haptor; a posterior pair of large hooks (marginal hooklets I of Llewellyn, 1963; posterior anchors of Ogawa & Egusa), five pairs of marginal hooklets each with a domus and between the two posteriormost marginal hooklets on each side, a single curved hook primordium (hamulus of Llewellyn; anterior anchors of Ogawa & Egusa).

The present study has revealed some additional features. Close to the lateral border of the head region on each side of the pigment-shielded eyes is a single spherical body which may be a photoreceptor without a pigment shield. Two kinds of unpigmented bodies, thought to be photoreceptors, have been recorded in other polyopisthocotyleans: a rhabdomeric structure in the oncomiracidium of *Diplozoon paradoxum* (see Kearn, 1978) and a cilia-based structure in the juvenile of *Sphyranura* sp. (see Kearn, 1984). The body and haptor of the oncomiracidium of *H. heterocerca* contain small numbers of randomly-distributed droplets (lipid ?) of various sizes, none of which are associated with the pigment-shielded eyes, and a few granules of a different nature are located posterior to the pharynx. These granules may be inside the intestine but the boundaries of this were not seen. There is a refringent terminal droplet attached externally at the apex of the posterior ciliated cone. Such droplets have been reported in other polyopisthocotylean oncomiracidia, for example in those of *Plectanocotyle gurnardi* and *Kuhnia* spp. (see Whittington & Kearn, 1989, 1990 respectively).

There is an extensive system of gland cells and ducts in the head region of the oncomiracidium. Ogawa & Egusa (1981, fig. 1b) illustrated the distal regions of these ducts near their openings on the anterolateral borders of the head region, but they did not illustrate the gland cell bodies or the paths followed by the proximal regions of the ducts. This is not surprising because the distal regions of the ducts appear to act as reservoirs for the secretion and are swollen and conspicuous, while the gland cells and the narrow proximal regions of the ducts contain relatively little secretion and are hard to identify. After a careful study of this gland cell system using interference contrast microscopy in more than twenty individuals, the tentative conclusion was reached that there are probably five gland cells on each side of the body lateral to the pharynx and five ducts travelling forwards to each anterolateral border of the head region. The five ducts leave each group of gland cells in two bundles, an outer bundle of two ducts and an inner bundle of three ducts; one duct in the inner bundle crosses over and joins the outer bundle, so that the two groups of swollen gland duct openings on each anterolateral border of the head region comprise an inner group of two and an outer group of three. A similar duct arrangement occurs in other polyopisthocotylean oncomiracidia, for example in those of *Plectanocotyle gurnardi* and *Kuhnia* spp. (see Whittington & Kearn, 1989, 1990 respectively).

There is a single gland cell on each side of the body just anterior to the haptor and two (?) gland cells in the midline in the anterior region of the haptor. The ducts from these cells were not observed.

The excretory system of the oncomiracidium of *H. heterocerca* has not previously been described. The flame cells are relatively long and narrow and even when beating are extremely inconspicuous. Four pairs of flame cells were detected with interference contrast microscopy, but it is possible that others have been overlooked. The longitudinal excretory ducts leading from the anterior and from the posterior flame cells contain flagella, as does the terminal duct (bladder ?) leading to the excretory pore.

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